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Indian Standard

GUIDELINES FOR HEAT HARDENED IRON ORE PELLETS FOR IRON MAKING IN BLAST FURNACES

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GUIDELINES FOR HEAT HARDENED IRON ORE PELLETS FOR IRON MAKING IN BLAST FURNACES

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Indian Standard

GUIDELINES FOR HEAT HARDENED IRON ORE PELLETS FOR IRON MAKING IN BLAST FURNACES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 May 1985, after the draft finalized by the Ores and Raw Materials Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 In recent years, there has been a wide interest in assessing the quality of blast furnace burden to attain higher output and operating efficiency. As such, this standard will serve as a guideline for the production of quality iron ore pellets with desirable physio-chemical properties.

0.3 In this standard, both desirable and limiting values of pellet properties are indicated. The limiting values are those beyond which pellets are generally considered unsuitable for use in blast furnaces.

0.4 The exact requirement of pellet properties, however, depend upon local factors, for example, extent of use of pellets in blast furnace, size of blast furnace, extent of adoption of technological improvements in blast furnace operation, availability of raw material under local conditions, etc. Therefore actual specification of pellets may be mutually agreed to between the producer and the purchaser depending on the requirements.

0.5 The property requirements of pellets may be broadly classified into the following categories:

a) Chemistry,
b) Size,
c) Physical strength,
d) Reducibility,
e) Swelling index, and
f) Softening characteristics.

0.6 This standard has been prepared keeping in view the experiments in the production and use of pellets in blast furnaces in India and countries abroad.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers guidelines for heat hardened iron ore pellets for production of quality pellets in terms of chemical and physical requirements.

2. CHEMICAL COMPOSITION

2.1 The chemical composition of the pellets largely depends on the availability of raw material. It is well established that self-fluxed pellets offer many advantages over acid pellets. The basicity of pellets should be such that other properties like strength, reducibility are conductive for smooth furnace operations.

The chemistry of pellets should be indicated by the following:

Total Fe
FeO
SiO_2
Al_2O_3
P
S
TiO_2
CaO
MgO
MnO
Cu
Moisture
Total Alkalis (Na_2O, K_2O)

*Rules for rounding off numerical values (*revised*).

3. SIZE

3.1 The acceptable optimum size of pellets at the blast furnace depends on the size distribution of other feed materials in the blast furnace burden, size range should be recorded as percentage of 9 to 16 mm fraction in a lot of pellets. The —5 mm fraction shall not exceed 3 percent in a lot supplied.

4. STRENGTH

4.1 The strength of pellet is usually measured in terms of its tumbler index and compressive strength. Suggested and desirable values of these measurements are indicated below.

4.2 Tumbler Index

4.2.1 The tumbler index shall not be less than 92 percent (+6·3 mm), when tested in accordance with IS : 6495-1984*.

4.2.2 The Abrasion Index, that is, the fraction under 1 mm after the tumbler test when determined in accordance with IS : 6495-1984* shall not exceed 3 percent.

4.3 Strength

4.3.1 *Compressive Strength* — The average compressive strength carried out on a specified number of individual pellets in a specified size range when determined in accordance with IS : 8625-1977† shall not be less than 200 kg/pellet. The pellets with a strength less than 80 kg should not exceed 5 percent in a lot.

4.3.2 *Compressive Strength After Reduction* — The average compressive strength after reductions when determined in accordance with IS : 8604-1977‡ shall not be less than 35 kg/pellet.

5. REDUCIBILITY

5.1 The reducibility of iron ore pellets when determined in accordance with IS : 8167-1976§ shall not be less than 50 percent. The relative reducibility for the chosen feed should also be assured as per IS : 11292-1985||.

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*Method for tumbler test for iron oxides: lump ore, sinter and pellets (*first revision*).

†Method for determination of crushing strength of iron ore pellets.

‡Method for determination of compression strength of iron ore pellets after reduction.

§Method for determination of reducibility of iron ore and sinter.

||Method for determination of relative reducibility of iron oxides: Lump ores, sinter and pellets.

6. SWELLING INDEX

6.1 The swelling index of pellets after reduction when determined in accordance with IS : 8624-1977* shall be 20 percent maximum.

7. SOFTENING CHARACTERISTICS

7.1 The softening characteristics of pellets when determined in accordance with IS : 9660-1980† shall be as agreed to between the buyer and the supplier. A typical acceptable value for the start of softening would be 1 150°C.

*Determination of swelling index of iron ore pellets.
†Guidelines for determination of softening characteristics of iron pellets.

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	k
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2